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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/055,580	01/22/2002	Jin-Yuan Lee	JCLA8676	6089

7590 02/25/2004  
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EXAMINER
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MITCHELL, JAMES M

ART UNIT	PAPER NUMBER
2827	

DATE MAILED: 02/25/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/055,580	<b>Applicant(s)</b> LEE ET AL.	
	<b>Examiner</b> James M. Mitchell	<b>Art Unit</b> 2827	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 04 August 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 78-91 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 78-91 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 January 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All   b) ☐ Some \*   c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                  | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____  |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)         | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____                                    |

**DETAILED ACTION*****Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 78-82, 84-89 and 91 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kitajima et al. (US 2002/0100972) in combination with Marrs et al (US 5,795,818) and Ho et al. (US 6,424,037).

Kitajima (Fig 11,19D; Par 0090-0091) discloses a cylindrical bonding structure (44) on a silicon chip (12) such that the structure may flip over and connect with a substrate, wherein the chip has at least one original bonding pad (14) on the chip and the substrate (22) has at least one junction pad (24) thereon, the cylindrical bonding structure comprising: a conductive cylinder (44) on the bonding pad of the chip; and a cylindrical solder cap (46) on the conductive cylinder; wherein the cylindrical solder cap has an outer diameter smaller than the diameter of the conductive cylinder, and the solder material has a melting point lower than the conductive cylinder material; wherein material forming the conductive cylinder is selected from gold; and the material forming the cylindrical solder cap is selected from a group consisting of tin, lead, copper, gold, silver, zinc, bismuth, magnesium, antimony, indium and an alloy of the aforementioned metals; , wherein the chip further inherently includes a

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redistribution circuit layer (via internal conductor that spreads signal to other areas) and the bonding pad is a pad on the redistribution circuit layer.

Kitajima does not appear to show a substrate surface having a patterned solder mask exposing junction pad or a transition layer with at least one conductive layer on the conductive cylinder, or that the diameter of the solder cap is smaller than the diameter of the opening in the patterned solder mask with a length greater than the depth of the opening.

Marrs (Fig 8) utilizes a patterned mask with an exposing junction pad (501C) and a cap (502) smaller than the opening of the mask (via formed within opening) with a length greater than the depth of the opening.

It would have been obvious to one of ordinary skill in the art to incorporate a mask on the substrate of Kitajima, such that the cap would be smaller than the opening of the mask in order to ensure that metallization is applied only to substrate bonding contacts as taught by Marrs (Col. 8, Lines 40-46).

Ho utilizes a transition layer (16a, 18a, 20a) with at least a conductive layer.

While neither Kitajima nor Marrs appear to disclose the use of a transition layer between high and low melting materials, Ho utilizes a transition layer.

It would have been obvious to one of ordinary skill in the art to incorporate a transition layer between the high and low melting materials of Kitajima, in order to enhance the interconnection height as taught by Ho (col.1-2, Lines 64-13).

Claims 83 and 90 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kitajima et. al. (US 2002/0100972), Marrs (US 5,795,818) and

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Ho (US 5,130,779) as applied to claims 78 and 85 and further in combination with Somaki (US. 5,641,113).

Neither Kitajima, Marrs or Ho appear to show a ball contact metallic layer between the conductive cylinder and the bonding pad; however Somaki (Fig 5) utilizes a ball contact metallic layer between the conductive cylinder and the bonding pad.

It would have been obvious to one of ordinary skill in the art to incorporate a ball layer between the conductive cylinder and the bonding pad of Kitajima, in order to increase strain resistance through the joint as taught by Somaki (Col. 2, Lines 30-34).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James M. Mitchell whose telephone number is (571) 272-1931. The examiner can normally be reached on M-F 6:30-3:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamand Cuneo can be reached on (571) 272-1957. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

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DAVID E. GRAYBILL  
PRIMARY EXAMINER